JEE Mains & Advanced Past Years Questions

JEE-MAIN
PREVIOUS YEARS

1. The eccentricity of an ellipse whose centre is at the origin is 1/2. If one of its directices is $x=-4$, then the equation of the normal to it at $\left(1,\frac{3}{2}\right)$ is: [*JEE Main-2017*]

   (*a*) $x+2y=4$ (*b*) $2y-x=2$
   (*c*) $4x-2y=1$ (*d*) $4x+2y=7$

2. If the curves $y^2=6x$, $9x^2+by^2=16$ intersect each other at right angles, then the value of b is: [*JEE Main-2018*]

   (*a*) $\frac{7}{9}$ (*b*) 4
   (*c*) $\frac{9}{2}$ (*d*) 6

3. Let $S=\left\{(x,y)\in R^2:\frac{y^2}{1+r}-\frac{x^2}{1-r}=1\right\}$, where $r\neq\pm 1$. Then S represents. [*JEE Main-2019 (January)*]

   (*a*) a hyperbola whose eccentricity is $\frac{2}{\sqrt{1-r}}$, when $0<r<1$
   (*b*) an ellipse whose eccentricity is $\sqrt{\frac{2}{r+1}}$, when $r>1$.
   (*c*) a hyperbola whose eccentricity is $\frac{2}{\sqrt{r+1}}$, when $0<r<1$.
   (*d*) an ellipse whose eccentricity is $\frac{1}{\sqrt{r+1}}$, when $r>1$.

4. Let the length of the latus rectum of an ellipse with its major axis long $x-$axis and center at the origin, be 8. If the distance the foci of this ellipse is equal to the length of the length of its minor axis, then which one of hte following points lies on it? [*JEE Main-2019 (January)*]

   (*a*) $(4\sqrt{2},2\sqrt{2})$ (*b*) $(4\sqrt{3},2\sqrt{2})$
   (*c*) $(4\sqrt{3},2\sqrt{3})$ (*d*) $(4\sqrt{2},2\sqrt{3})$

5. If tangents are drawn to the ellipse $x^2+2y^2=2$ at all points on the ellipse other than its four vertices than the mid points of the tangents intercepted between the coordinate axes lie on the curve: [*JEE Main-2019 (January)*]

   (*a*) $\frac{1}{4x^2}+\frac{1}{2y^2}=1$ (*b*) $\frac{x^2}{4}+\frac{y^2}{2}=1$
   (*c*) $\frac{1}{2x^2}+\frac{1}{4y^2}=1$ (*d*) $\frac{x^2}{2}+\frac{y^2}{4}=1$

6. Let S and S' be the foci of an ellipse and B be any one of the extremities of its minor axis. If $\Delta S'BS$ is a right angled triangle with right angle at B and area $(\Delta S'BS)=8$ *sq.* units, then the length of a latus rectum of the ellipse is : [*JEE Main-2019 (January)*]

   (*a*) 4 (*b*) $2\sqrt{2}$
   (*c*) $4\sqrt{2}$ (*d*) 2

7. If the tangents on the ellipse $4x^2 + y^2 = 8$ at the points (1, 2) and (a, b) are perpendicular to each other, then a^2 is equal to: [JEE Main-2019 (April)]

(a) $\frac{64}{17}$ (b) $\frac{2}{17}$

(c) $\frac{128}{17}$ (d) $\frac{4}{17}$

8. In an ellipse, with centre at the origin, if the difference of the lengths of major axis and minor axis is 10 and one of the foci is at $(0, 5\sqrt{3})$, then the length of its latus rectum is: [JEE Main-2019 (April)]

(a) 10 (b) 8

(c) 5 (d) 6

9. The tangent and normal to the ellipse $3x^2 + 5y^2 = 32$ at the point $P(2, 2)$ meet the x-axis at Q and R, respectively. Then the area (in sq. units) of the triangle PQR is: [JEE Main-2019(April)]

(a) $\frac{14}{3}$ (b) $\frac{16}{3}$

(c) $\frac{68}{15}$ (d) $\frac{34}{15}$

10. If the line $x - 2y = 12$ is tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at the point $\left(3, \frac{-9}{2}\right)$, then the length of the latus rectum of the ellipse is : [JEE Main-2019(April)]

(a) 9 (b) $8\sqrt{3}$

(c) $12\sqrt{2}$ (d) 5

11. If the normal to the ellipse $3x^2 + 4y^2 = 12$ at a point P on it is parallel to the line, $2x + y = 4$ and the tangent of the ellipse at P passes through $Q(4,4)$ then PQ is equal to : [JEE Main-2019 (April)]

(a) $\frac{\sqrt{221}}{2}$ (b) $\frac{\sqrt{157}}{2}$

(c) $\frac{\sqrt{61}}{2}$ (d) $\frac{5\sqrt{5}}{2}$

12. An ellipse, with foci at $(0, 2)$ and $(0, -2)$ and minor axis of length 4, passes through which of the following points? [JEE Main-2019 (April)]

(a) $(1, 2\sqrt{2})$ (b) $(2, \sqrt{2})$

(c) $(2, 2\sqrt{2})$ (d) $(\sqrt{2}, 2)$

13. If the distance between the foci of an ellipse is 6 and the distance between its directrices is 12, then the length of its latus rectum is [JEE Main-2020 (January)]

(a) $\sqrt{3}$ (b) $3\sqrt{2}$

(c) $\frac{3}{\sqrt{2}}$ (d) $2\sqrt{3}$

14. If $3x + 4y = 12\sqrt{2}$ is a tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{9} = 1$ for some $a \in R$ then the distance between the foci of the ellipse is: [JEE Main-2020 (January)]

(a) $2\sqrt{2}$ (b) $2\sqrt{7}$

(c) 4 (d) $2\sqrt{5}$

15. Let the line $y = mx$ and the ellipse $2x^2 + y^2 = 1$ intersect at a point P in the first quadrant. If the normal to this ellipse at P meets the co-ordinate axes at $\left(\frac{-1}{3\sqrt{2}}, 0\right)$ and $(0, \beta)$, then β is equal to [JEE Main-2020(January)]

(a) $\frac{2}{\sqrt{3}}$ (b) $\frac{\sqrt{2}}{3}$

(c) $\frac{2}{3}$ (d) $\frac{2\sqrt{2}}{3}$

16. The length of the minor axis (along y-axis) of an ellipse in the standard form is $\frac{4}{\sqrt{3}}$. If this ellipse touches the line, $x + 6y = 8$; then its eccentricity is: [JEE Main-2020(January)]

(a) $\frac{1}{3}\sqrt{\frac{11}{3}}$ (b) $\sqrt{\frac{5}{6}}$

(c) $\frac{1}{2}\sqrt{\frac{11}{3}}$ (d) $\frac{1}{2}\sqrt{\frac{5}{3}}$

17. Let $x = 4$ be a directrix to an ellipse whose centre is at the origin and its eccentricity is $\frac{1}{2}$. If $P(1, \beta), \beta > 0$ is a point on this ellipse, then the equation of the normal to it at P is [JEE Main-2020(September)]

(a) $7x - 4y = 1$ (b) $4x - 2y = 1$

(c) $4x - 3y = 2$ (d) $8x - 2y = 5$

18. Let $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ $(a > b)$ be a given ellipse, length of whose latus rectum is 10. If its eccentricity is the maximum value of the function, $\phi(t) = \frac{5}{12} + t - t^2$, then $a^2 + b^2$ is equal to: [JEE Main-2020 (September)]

(a) 135 (b) 116

(c) 126 (d) 145

19. If the point P on the curve, $4x^2 + 5y^2 = 20$ is farthest from the point $Q(0, -4)$, then PQ^2 is equal to : [JEE Main-2020(September)]

(a) 29 (b) 48

(c) 21 (d) 36

20. If the co-ordinates of two points A and B are $(\sqrt{7}, 0)$ and $(-\sqrt{7}, 0)$ respectively and P is any point on the conic, $9x^2 + 16y^2 = 144$, then $PA + PB$ is equal to:
[JEE Main-2020(September)]

(a) 9 (b) 16
(c) 6 (d) 8

21. If the normal at an end of a latus rectum of an ellipse passes through an extremity of the minor axis, then the eccentricity e of the ellipse satisfies:
[JEE Main-2020(September)]

(a) $e^2 + 2e - 1 = 0$ (b) $e^2 + e - 1 = 0$
(c) $e^4 + 2e^2 - 1 = 0$ (d) $e^4 + e^2 - 1 = 0$

22. Which of the following points lies on the locus of the foot of perpendicular drawn upon any tangent to the ellipse, $\frac{x^2}{4} + \frac{y^2}{2} = 1$ from any of its foci?
[JEE Main-2020(September)]

(a) $(1, 2)$ (b) $(-2, \sqrt{3})$
(c) $(-1, \sqrt{3})$ (d) $(-1, \sqrt{2})$

23. If the curve $x^2 + 2y^2 = 2$ intersects the line $x + y = 1$ at two points P and Q, then the angle subtended by the line segment PQ at the origin is:
[JEE Main-2021 (Fabruary)]

(a) $\frac{\pi}{2} + \tan^{-1}\left(\frac{1}{4}\right)$ (b) $\frac{\pi}{2} - \tan^{-1}\left(\frac{1}{4}\right)$
(c) $\frac{\pi}{2} + \tan^{-1}\left(\frac{1}{3}\right)$ (d) $\frac{\pi}{2} - \tan^{-1}\left(\frac{1}{3}\right)$

24. Let L be a common tangent line to the curves $4x^2 + 9y^2 = 36$ and $(2x)^2 + (2y)^2 = 31$. Then the square of the slope of the line L is
[JEE Main-2021 (Fabruary)]

25. If the point of intersections of the ellipse $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$ and the circle $x^2 + y^2 = 4b$, $b > 4$ lie on the curve $y^2 = 3x^2$, then b is equal to:
[JEE Main-2021 (March)]

(a) 12 (b) 5
(c) 6 (d) 10

26. Let L be a tangent line to the parabola $y^2 = 4x - 20$ at $(6, 2)$. If L is also a tangent to the ellipse $\frac{x^2}{2} + \frac{y^2}{b} = 1$, then the value of b is equal to;
[JEE Main-2021 (March)]

(a) 11 (b) 14
(c) 16 (d) 20

JEE-ADVANCED PREVIOUS YEARS

1. The ellipse $E_1 : \frac{x^2}{9} + \frac{y^2}{4} = 1$ is inscribed in a rectangle R whose sides are parallel to the coordinate axes. Another ellipse E_2 passing through the point $(0, 4)$ circumscribes the rectangle R. The eccentricity of the ellipse E_2 is
[IIT JEE-2012]

(a) $\frac{\sqrt{2}}{2}$ (b) $\frac{\sqrt{3}}{2}$
(c) $\frac{1}{2}$ (d) $\frac{3}{4}$

2. Consider two straight lines, each of which is tangent to both the circle $x^2 + y^2 = \frac{1}{2}$ and the parabola $y^2 = 4x$. Let these lines intersect at the point Q. Consider the ellipse whose center is at the origin $O(0, 0)$ and whose semi-major axis is OQ. If the length of the minor axis of this elipse is $\sqrt{2}$, then the which of the following statement(s) is (are) TRUE?
[JEE Advanced-2018]

(a) For the ellipse, the eccentricity is $\frac{1}{\sqrt{2}}$ and the length of the latus rectrum is 1

(b) For the ellipse, the eccentricity is $\frac{1}{2}$ and the length of the latus rectum is $\frac{1}{2}$

(c) The area of the region bounded by the ellipse between the lines $x = \frac{1}{\sqrt{2}}$ and $x = 1$ is $\frac{1}{4\sqrt{2}}(\pi - 2)$

(d) The area of the region bounded by the ellipse between the lines $x = \frac{1}{\sqrt{2}}$ and $x = 1$ is $\frac{1}{16}(\pi - 2)$

3. Define the collections $\{E_1, E_2, E_3, \ldots\}$ of ellipes and $\{R_1, R_2, R_3, \ldots\}$ of rectangles as follows:

$E_1 : \frac{x^2}{9} + \frac{y^2}{4} = 1$;

R_1 : rectangle of largest area, with sides parallel to the axes, inscribed in E_1;
[JEE Advanced-2019]

E_n : ellipse $\frac{x^2}{a_n^2} + \frac{y^2}{b_n^2} = 1$ of largest area inscribed in R_{n-1}, $n > 1$;

R_n : rectangle of largest area, with sides parallel to the axes, inscribed in E_n, $n > 1$.

Then which of the following options is/are correct?

(a) The eccentricities of E_{18} and E_{19} are NOT equal

(b) The distance of a focus from the centre in E_9 is $\frac{\sqrt{5}}{32}$

(c) The length of latus rectum of E_9 is $\frac{1}{6}$

(d) $\sum_{n=1}^{N} (\text{area of } R_n) < 24$, for each positive integer N

4. Let E be the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$. For any three distinct points P, Q and Q' on E, let $M(P, Q)$ be the mid-point of the line segment joining P and Q, and $M(P, Q')$ be the mid-point of the line segment joining P and Q'. Then the maximum possible value of the distance between $M(P, Q)$ and $M(P, Q')$, as P, Q and Q' vary on E, is _____
[JEE Advance-2021]

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JEE-MAIN
PREVIOUS YEARS

1. (*c*) **2.** (*c*) **3.** (*b*) **4.** (*b*) **5.** (*c*) **6.** (*a*) **7.** (*b*) **8.** (*c*) **9.** (*c*) **10.** (*a*) **11.** (*d*) **12.** (*d*)
13. (*b*) **14.** (*b*) **15.** (*b*) **16.** (*c*) **17.** (*b*) **18.** (*c*) **19.** (*d*) **20.** (*d*) **21.** (*d*) **22.** (*c*) **23.** (*a*) **24.** (3)
25. (*a*) **26.** (*b*)

JEE-ADVANCED
PREVIOUS YEARS

1. (*c*) **2.** (*a*, *c*) **3.** (*c*, *d*) **4.** (4)